AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

RISK

1977
C.2

UNIVERSITY OF CALIFORNIA
GIANNINI FOUNDATION OF AGRICULTURAL ECONOMICS LIBRARY
Agricultural Economics Library
SEP 1 1977

IMPLICATIONS OF RISK FOR AGRICULTURAL DEVELOPMENT POLICIES*

Richard K. Perrin**

There can be little doubt that farmers confront risks, whether they be farmers of advanced or less developed economies. And despite Roumasset's arguments to the contrary, I have little doubt that resource allocation given this risk is different than it would have been in the absence of risk. The issue I've been asked to address is the policy implications of such a state of affairs.

I will first argue that economic theory provides no a priori grounds for asserting that there are any policy implications of risk. To support this argument I will outline the classic welfare propositions and demonstrate their limitations in making such inferences, both in general and for particular kinds of agricultural markets. I will then argue that there are, however, a priori policy implications for the production and communication of information, a good which is closely related to, but not synonymous with risk.

Risk and the Efficiency of Market Institutions

Public policies can be justified on any number of grounds. One of these is economic efficiency, and it is the only one about which economic theory has much to offer. Perhaps the most widely accepted criterion for judging the economic efficiency of a change in market institutions is the Hicks-Kaldor version of the Pareto criterion which states that if gainers evaluate their gains at a higher figure than losers evaluate their losses, then the change increases economic efficiency. So the task of the economist in evaluating a public policy is to assist in identifying and measuring the gains and losses which would occur because of changes in market institutions which that policy causes. Stigler, and Pasour and Bullock (among others) have warned us that we often carelessly misuse the propositions of standard welfare theory in accomplishing this task. It is not sufficient to invoke "market failure" or "market imperfections" to establish the potential for a Hicks-Kaldor efficient policy change. To see why, we must briefly review that welfare theory.

In the absence of risk and in the absence of transactions costs,[2] it is well established that a "perfectly" competitive market equilibrium will result in an optimal allocation of resources. This optimality of market equilibrium cannot be presumed where this perfectly-competitive norm is not met. Departures from the norm can result from departures from atomistic competition, but even competitive markets can fail to achieve optimality in the case of public goods, or in case of externalities, or where related markets are not efficient (the second best proposition). But some recent

*Paper prepared for the annual meeting of the American Agricultural Economics Association, San Diego, August, 1977. I acknowledge valuable comments from Loren Ihnen, E. C. Pasour and Grant Scobie.

**Professor, Department of Economics and Business, North Carolina State University, Raleigh, North Carolina.

lines of thought have shown that the optimality of the perfectly competitive norm is not necessarily negated by the existence of risk. (See Mossin, especially Chapter 14, for a summary of the extensions of mean-variance asset valuation theory which have led to this conclusion). Thus the risk-extended standard welfare theory leads us to conclude that in a risky world without transactions costs, competitive markets will be efficient, apart from the public goods and externalities exceptions noted above. But can we conclude the opposite - that where monopolistic tendencies, public goods, or externalities exist, the market allocation will be inefficient? If we stay in the world of no transactions costs, we might make this conclusion, I think, simply because optimal policies could be costlessly determined and implemented which would exactly internalize all externalities, extract appropriate charges for public goods, and appropriately regulate monopolies.

But once we recognize that there are transactions costs associated with the determination of and implementation of policies which would internalize externalities, etc., it is no longer clear that the market allocation will be inefficient even where monopolies externalities and public goods exist. The burden of economic analysis is then to ascertain whether the potential gains, from moving to a resource allocation consistent with the perfectly competitive norm, will be sufficient to offset the new transactions costs. Furthermore, once transactions costs are introduced, we no longer have general models which allow us to characterize the efficiency of even the competitive equilibrium which might exist in such markets. (The two series of papers appearing in the May, 1976, issue of the American Economic Review, and the November, 1976, issue of the Quarterly Journal of Economics offer a sample of theoretical work underway to characterize such markets.) Let me now turn to examine, in light of these problems, some of the alleged policy implications of risk.

Price subsidization and stabilization

Both Anderson, et al., and Roumasset suggest that where risks affect allocative decisions, price subsidies should improve allocative efficiency. (But neither reference urges such a policy.) There are two supposed justifications for such a conclusion. Arrow and Lind show that if the cost of bearing a particular risk is spread across all members of society, the risk cost to any given person is negligible, while the total expected returns remain undiminished. They then go on to establish the optimality of such a state. Since risks are negligible in this state, resources will be allocated using the risk-free discount rate. But since this isn't generally observed in agriculture, they would infer that the observed state is inefficient. In a distinctly different approach, Mossin shows that if all risks in society are pooled, risks of individual ventures will be essentially pooled away, the investment (and evaluation) criterion will depart negligibly from the risk-free discount rate, and the resulting state is optimal.[3] Again one is tempted to conclude that where investment behavior is observed to depart from this ideal, the observed state is inefficient.

Now if one accepts the proposition that a market characterized by risk-free investment criteria is optimal, then it is tempting to

favor policies which draw behavior closer to this optimal state. Price subsidies for inputs, or bounties for output, would generally have this effect. But there are two flaws in this logic, which were previously suggested. In the first instance, there are transactions costs associated with determining which prices to subsidize and how much. I'll try to show that these may be very large. In the second instance, there will also be many transactions costs affecting decisions under the existing market institutions. Once these transactions costs are recognized, the conclusions from the Arrow-Lind or Mossin theories no longer hold, and we cannot be sure that movement toward the norm of risk-free investment criteria will improve efficiency (even if there were no transactions costs associated with the policies themselves).

Turn now to the cost of determining an appropriate price policy. The amount of subsidy required to realize risk-neutral levels of resource allocation will vary from farmer to farmer, from commodity to commodity, and from input to input. Negative subsidies will be appropriate for some inputs such as insecticides. Hence an across-the-board subsidy may even cause further divergences from the risk-neutral optima on the average. But aside from this, we must ask from what other uses the resources will be diverted in order to increase their allocation to a given commodity. If the alternative use is also for risky production (as it must be), then some welfare losses will occur because of further divergences of resource use from the risk-neutral level in the alternative. So these costs must be considered or else such subsidies should be applied to all production, not just corn, or not just agriculture. Then in order to be sure that the subsidies will increase welfare, we would have to insure that subsidies be in proportion to risks. To do this would require enormous costs for evaluating risks and for administering the subsidies.

So the welfare implications of price policies are much more difficult to establish than it may at first seem.

Price stabilization policy has the obvious appeal of eliminating a source of risk, which would seem to be a good thing. But the reduction in risk will be illusory to the extent that prices and production fluctuations are in opposite directions, as they usually are in agriculture, because gross income variability will be thereby increased. Another possible objection is the extent to which public storage schemes to stabilize prices would merely substitute for private storage activities, resulting in no gain. In any case, the incidence of welfare gains from stabilization is a time-honored topic in economics literature, and conclusions depend largely on the structure assumed (see Just for a recent review of and contribution to this literature).

Insurance subsidies

Insurance is a mechanism through which risks may be pooled. If transactions costs associated with insurance were zero, insurance would provide a method of eliminating risks so as to achieve the optimal resource allocations described by the Arrow-Line and Mossin models. So it is not surprising to encounter arguments for subsidization of insurance, since it is clear that this "ideal" of

completely insured (or otherwise pooled) risks is not realized in agriculture. But for reasons by now familiar, this ideal is not relevant to a world in which transactions costs do exist. Given that there are transactions costs, acturial odds for the farmer must be less than perfect, and this itself would reduce participation But moral hazard and adverse selection are additional sources of concern about the optimality of private insurance markets.

Moral hazard in its broadest sense is the shift in the distribution of returns from an enterprise that is caused by changed incentives to the entrepeneur when part of the risk is shared through insurance. For example, once a crop is insured, incentives for crop protection are reduced and the probability of crop losses increases. This phenomenon further reduces the actuarial odds of the insurance policy, and thus further reduces the extent of risk sharing. If there were no costs to writing and enforcing contracts which preserve incentives, the costs of moral hazard could be eliminated. But since this is not possible, there seems to be no policy option with promise of regaining the losses imposed by moral hazard.

The problem of adverse selection was brought to our attention by Ackerlof. Assume that farmers of an area do not all face the same risks, due to differences in soils, investment in human or physical capital, etc. If an insurance policy were offered to all farmers on the basis of the average actuarial risks, the half of the farmers with lower risks would not choose to participate, while the half with the highest risks would (assume they were risk averse). Through such adverse selection, the riskiness of the insured group would be greater than for the entire population. If the premium is raised accordingly, then additional adverse selection will take place, and it is not difficult to imagine that this iterative process would cause market breakdown due to dwindling trading. This problem arises because of the asymmetry in information between insurors and insurees. To the extent that insurors can economically obtain the information that the insurees have (through screening information of one type or another), the market can function.

One solution to market breakdown due to adverse selection is to require everyone to participate, charging an average premium to all. This policy has low transaction costs, but it will also be inefficient to the extent that premiums do not reflect actuarial costs for non-average individuals. Furthermore, if private companies provide the insurance, adverse selection will still leave screened-out insurees without a contract. Hence mandatory government insurance is suggested by many. But as Grossman and Stiglitz note, it is most difficult to compare the economic efficiency of two very imperfect allocative approaches such as these.

Credit subsidies

Credit markets are plagued by the same transactions problem as insurance markets - trading costs, adverse selection, and moral hazard. Most of the same difficulties attend the evaluation of public policy. An additional policy issue is how public funds for credit, presumably limited, are to be allocated among farmers. Any allocation process aimed at avoiding the problems of adverse

selection and moral hazard would seem to require undertaking the same kinds of transaction costs required under a market system, which would tend to negate the value of the policy.

Land tenure policies

Land tenure institutions involve complex contracts in which the two parties contribute not just land and labor, but also management, capital, information, and risk assumption. Chueng and Newbery have suggested that risk considerations are important components of these contracts, though Reid disputes this. I believe we do not yet understand the role of traditional tenure arrangements in sharing risks and reducing the kinds of transactions costs I have mentioned. Until we do, we cannot very adequately assess the implications of risk and risk aversion for land tenure policies.

Research and Information Policies

Information as a commodity is certainly related to risk, for with perfect information there would be no risk. But the economic arguments for public research and information activities are not based on the riskiness of these activities (though risky they are). Rather the arguments are based on the public goods characteristics of information - the marginal costs of additional persons using a bit of information are argued to be negligible, and it is very expensive to exclude others from using information once it is generated. While there are certainly some questions which can be raised about this justification, I will pass over them here. (The rates of return on public research activities /Eckaus, Chapter 6/ certainly don't indicate that we have over invested in this area.) Instead I'd like to briefly discuss some of the implications of risk and learning conduct for the ways in which these public activities are undertaken.

Research

I think that if we understood reasonably well the risks that farmers face and their aversion to it, we would be developing and recommending technologies (for less developed agriculture, at least) with: a) lower investment at risk than at present, and b) productivity which is less sensitive to changes in weather, location effects, managerial skills, and plagues. We have indeed seen some movement in these directions. But this trend could benefit from additional economic research of several types. For one thing, we have little evidence regarding the divergence between the risk which farmers perceive, and those which we might perceive based on experimental trials. A farmer has additional sources of variability to consider compared to the researcher (weather, location, management, and pests, again), and at the same time has less information about new technologies. Until we know more about the process by which farmers form expectations, we can't say whether farmers' behavior will be affected more by providing more information or by providing less sensitive technologies. I am not aware of any recent research on this process.

The contribution of economists to the study of yield variability and its sources is critical because physical scientists are generally ill equipped to specify appropriate sampling procedures over space, across time, and across management skills. Neither are they prepared to infer from these sample results the inherent risks faced by the farmer population of interest. Economic research can be useful here as well as in characterizing more fully farmer reaction to risk.

Production and dissemination of information

Information, whether about technology or about forthcoming natural and market events, reduces risk. Again, I will not argue the appropriateness of the governmental role in production and dissemination of this information, from the point of view of economic efficiency. But the effectiveness of government activity could surely be improved if we better understood the process by which farmers seek information and transform it into expectations about the future. What sources or kinds of information weight most heavily into the expectations process? Can farmers' learning and expectations process be adequately described by the Bayesian-Bernoullian model (as in Chang or O'Mara, for example)? What is the role of learning by doing versus learning by communication (Grossman, Kihlstrom and Miran)? These are questions worthy of research efforts, because the answers will have implications for the most cost-effective methods of generating and disseminating information.

We have seen a number of studies (see Schultz) relating the general education level of farmers to their ability to acquire and process information. The results seem to be positive, but are we measuring the contribution of education, or merely the screening value of education for identifying skills which already exist? What other kinds of educational programs enhance these skills? Such questions are being addressed by other economists, and such research would seem useful in developing agricultural areas, as well.

Summary

Traditional welfare theory suggests that where an economy is observed to depart from the perfectly competitive norm, the resulting resource allocation may not be efficient. But we often tend to conclude more than is proven by the theory, namely that where the competitive norm is absent, a change in market institutions will improve efficiency. Furthermore, once transactions costs are introduced into the models, it is no longer clear how we can identify a competitive equilibrium or whether it is efficient if we observe it. The implications of this for the relationship between risk and policy are that there is no necessary relationship. But I have accepted, rather uncritically, the proposition that government action in production and dissemination of new information is less susceptible to these objections I believe that economic research can make valuable contributions to the implementation of this type of government action. Given the relatively lower level of information in general, and skills to process that information, in less developed agricultural areas, I would expect this research to be particularly valuable in these areas.

Notes

[1]By risk I refer to a lack of perfect information about the outcome of decisions. I make no distinction here between risk and uncertainty. I assume throughout this paper that risk can be represented by a subjective frequency distribution of outcomes from a decision, that this distribution is determined by the amount of information available, and that any two persons with the same information will perceive the same distribution of outcomes.

[2]By transactions costs, I refer to such as costs of trading, costs of generating and communicating information, and costs of enforcing contractual rights or property rights.

[3](See Fama and Miller, pp. 286-292 for this interpretation of the equilibrium market valuation formula (also known as the capital asset pricing formula).)

References

Akerlof, G. A. "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanisms". Quarterly Journal of Economics. 84(1970):488-500.

Anderson, J. R., J. L. Dillon and B. Hardaker. Agricultural Decision Analysis. Ames, Iowa: Iowa State University Press, 1977.

Arrow, K. J. "The Organization of Economic Activity: Issues Pertinent to the Choice of Market Versus Nonmarket Allocation". Chapter 2 in Hareman, R. H. and J. Margolis, Public Expenditures and Policy Analysis. Chicago: Markham, 1970.

Arrow, K. J. and R. C. Lind. "Uncertainty and the Evaluation of Public Investment Decisions". American Economic Review. 60(1970): 364-78.

Bullock, J. B. and S. H. Logan. "An Application of Statistical Decision Theory to Cattle Feedlot Marketing". American Journal of Agricultural Economics. 52(1970): 234-241.

Carlson, G. A. "Pest Control Risks in Agriculture". Paper presented at the ADC conference on Uncertainty and Agricultural Development, CIMMYT, Mexico. Proceedings forthcoming by Agricultural Development Council, New York.

Chang, S. J. "An Economic Analysis of the Adoption of New Wheat Varieties Under Uncertainty in Ferozepu District (India)", Ph.D. Thesis, North Carolina State University, 1976.

Cheung, S. N. S. The Theory of Share Tenancy. Chicago: University of Chicago Press, 1969.

Doll, J. P. "Obtaining Preliminary Bayesian Estimates of the Value of a Weather Forecast". American Journal of Agricultural Economics. 53(1971): 651-655.

Eckaus, R. S. Appropriate Technologies for Developing Countries Washington: National Academy of Sciences, 1977.

Fama, E. and M. Miller. The Theory of Finance. New York: Holt, Rinehart and Winston, 1972.

Grossman, S. J., R. E. Kihlstrom and L. J. Mirman. "A Bayesian Approach to the Production of Information and Learning by Doing". Technical Report No. 185, Institute for Mathematical Studies in the Social Sciences. Stanford, 1975.

Grossman, S. J. and J. E. Stiglitz. "Information and Competitive Price Systems". American Economic Review. 66(1976): 246-253.

Just, R. "A Generalization of Some Issues in Stochastic Welfare Economics: Implications for Agricultural Price Stabilization". Agricultural Experiment Station Research Report P-712, Stillwater, Oklahoma, 1975.

Mossin, J. The Economic Efficiency of Financial Markets. Lexington, Mass. D. C. Heath, 1977.

Newbery, D. M. G. "Risk Sharing, Sharecropping and Uncertain Labor Markets". Technical Report No. 202, Institute for Mathematical Studies in the Social Sciences. Stanford, 1976.

Reid, J. D. "The Theory of Share Tenancy Revisited-Again". Journal of Political Economy. 85(1977):403-407.

O'Mara, G. T. "A Decision-Theoretic View of the Microeconomics of Technique Diffusion in a Developing Country". Ph.D. Thesis, Stanford University, 1971.

Pasour, E. C., Jr. and J. B. Bullock. "Implications of Uncertainty for the Measurement of Efficiency". American Journal of Agricultural Economics. 57(1975): 335-339.

Roumasset, J. Rice and Risk: Decision Making Among Low-Income Farmers. Amsterdam: North Holland, 1976.

Rothschild, M. "Models of Market Organization with Imperfect Information: A Survey". Journal of Political Economy. 81(1973): 1283-1308.

Schultz, T. W. "The Value of the Ability to Deal with Equilibrium". Journal of Economic Literature. 8(1975): 827-846.

Stigler, George. "Imperfections in the Capital Market". Journal of Political Economy. 75(1967): 287-292.